Fig. 1

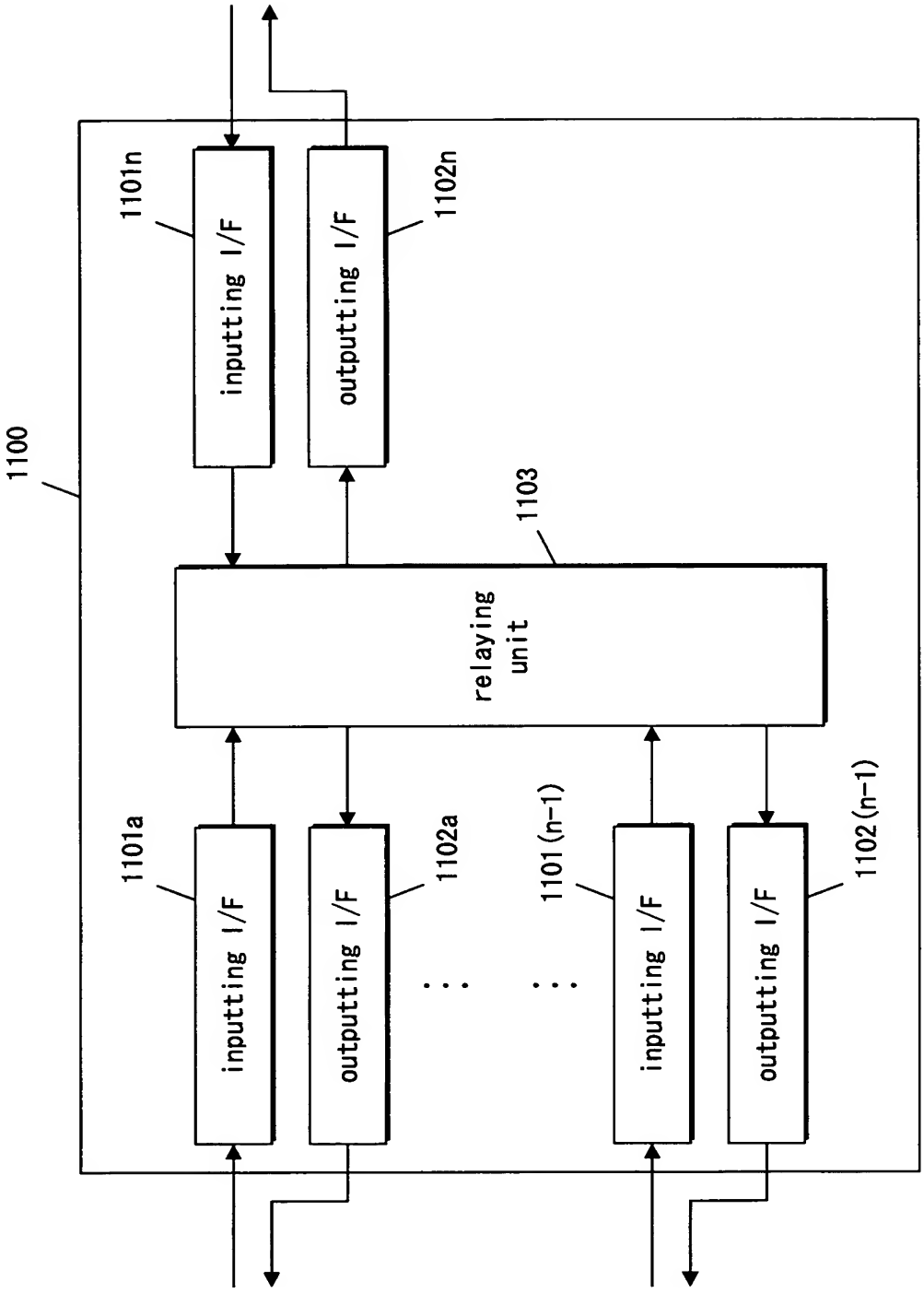

1100
1101n
inputting I/F
1102n
outputting I/F
1103
relaying unit
1101a
inputting I/F
1102a
outputting I/F
1101(n-1)
inputting I/F
1102(n-1)
outputting I/F

Fig. 2

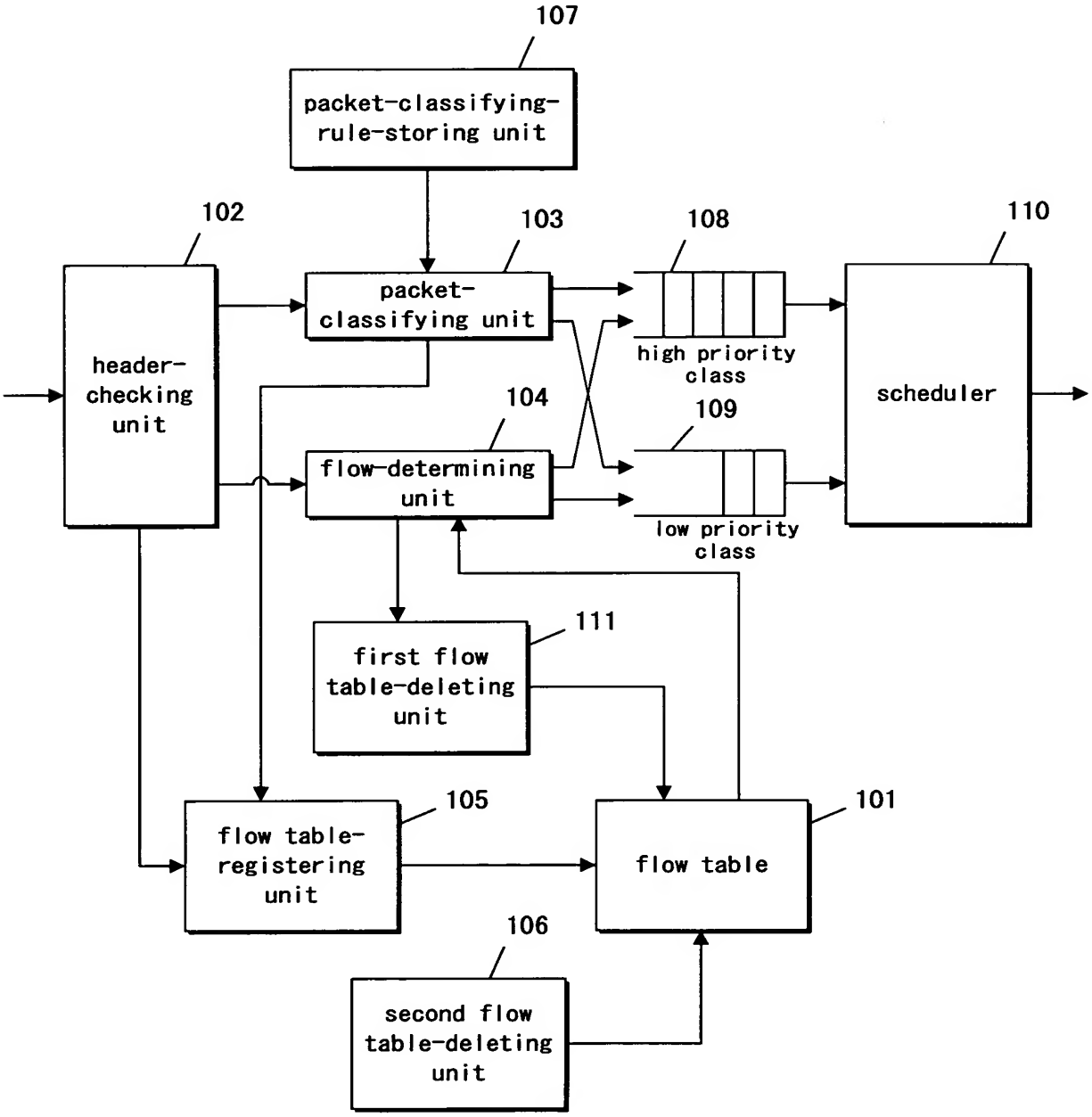
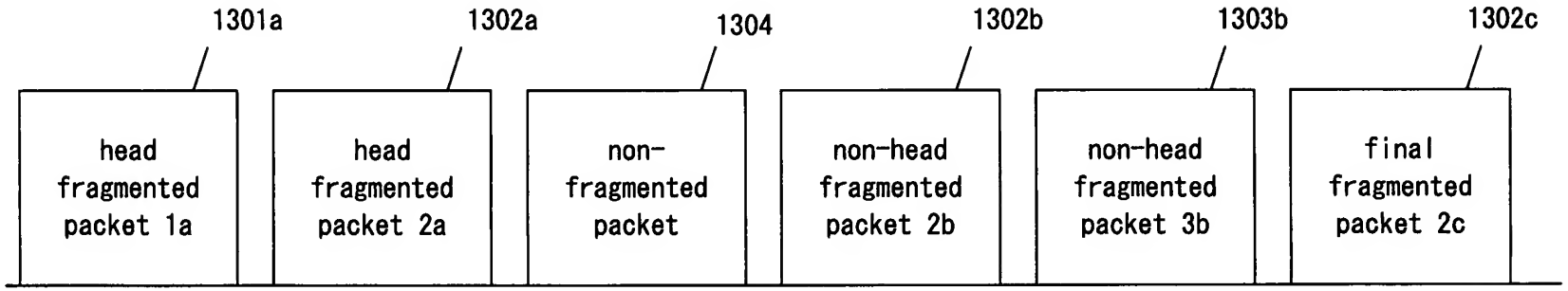

107
packet-classifying-rule-storing unit
102
103
108
110
header-checking unit
packet-classifying unit
high priority class
scheduler
104
109
flow-determining unit
low priority class
111
first flow table-deleting unit
105
101
flow table-registering unit
flow table
106
second flow table-deleting unit

Fig. 3



src IP	address 1	src IP	address 1	src IP	address 2	src IP	address 1	src IP	address 1	src IP	address 1
dst IP	address b	dst IP	address a	dst IP	address c	dst IP	address a	dst IP	address b	dst IP	address a
protocol	TCP	protocol	TCP	protocol	UDP	protocol	TCP	protocol	TCP	protocol	TCP
src port	80	src port	80	src port	2000	src port	—	src port	—	src port	—
address ID	ID1	address ID	ID1	address ID	ID1	address ID	ID1	address ID	ID2	address ID	ID1

packets flow in this direction

Fig. 4

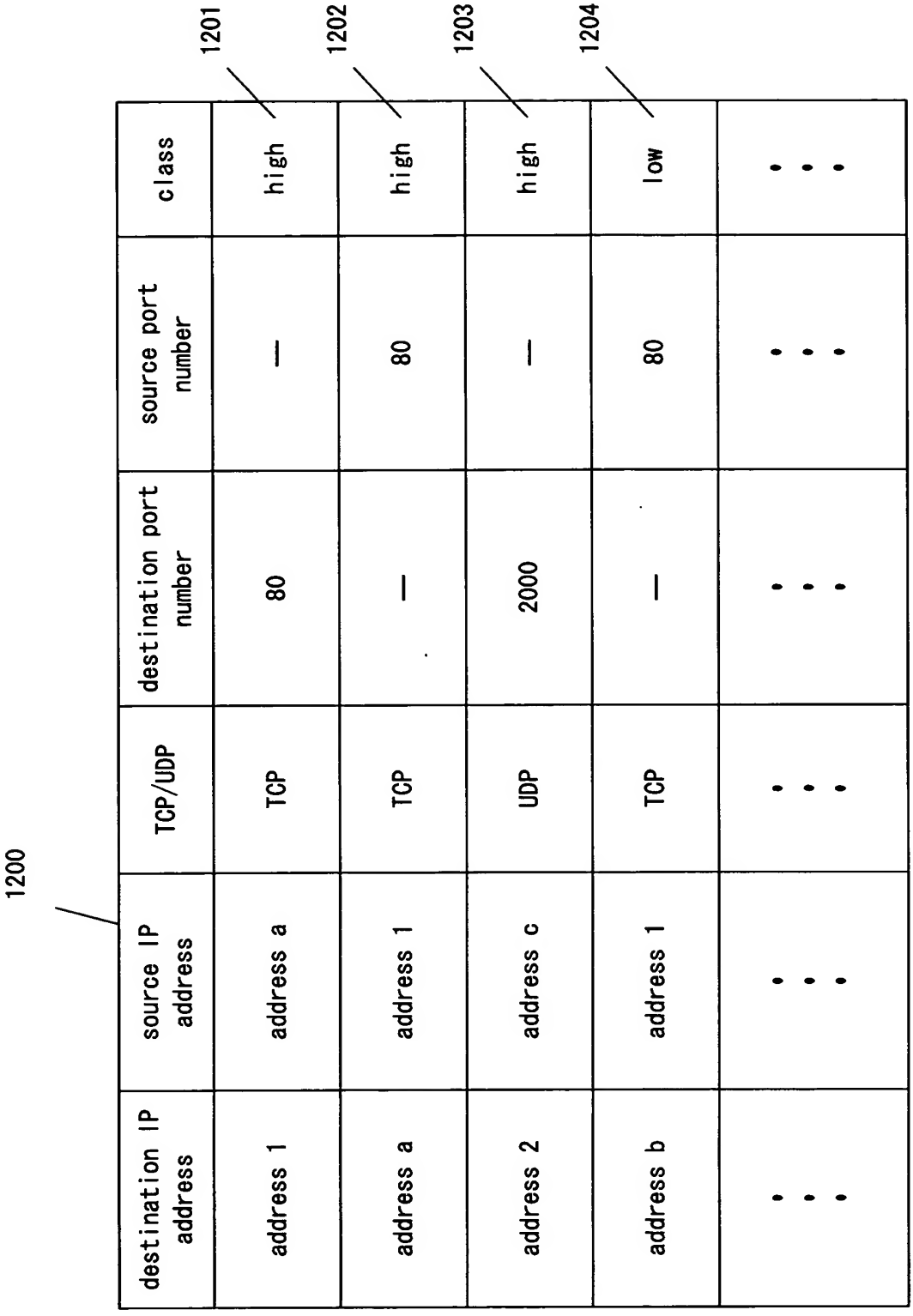

1200
destination IP address
source IP address
TCP/UDP
destination port number
source port number
class
address 1
address a
TCP
80
—
high
address a
address 1
TCP
—
80
high
address 2
address c
UDP
2000
—
high
address b
address 1
TCP
—
80
low
1201
1202
1203
1204

Fig. 5(a)

1401

destination IP address	source IP address	TCP/UDP	address ID	class
address b	address 1	TCP	ID1	low
address a	address 1	TCP	ID1	high

1401a

1401b

Fig. 5(b)

1402

destination IP address	source IP address	TCP/UDP	address ID	class
address b	address 1	TCP	ID1	low

1402b

Fig. 5(c)

1403

destination IP address	source IP address	TCP/UDP	address ID	class
address c	address 2	UDP	2001	high

1403c

Fig. 6

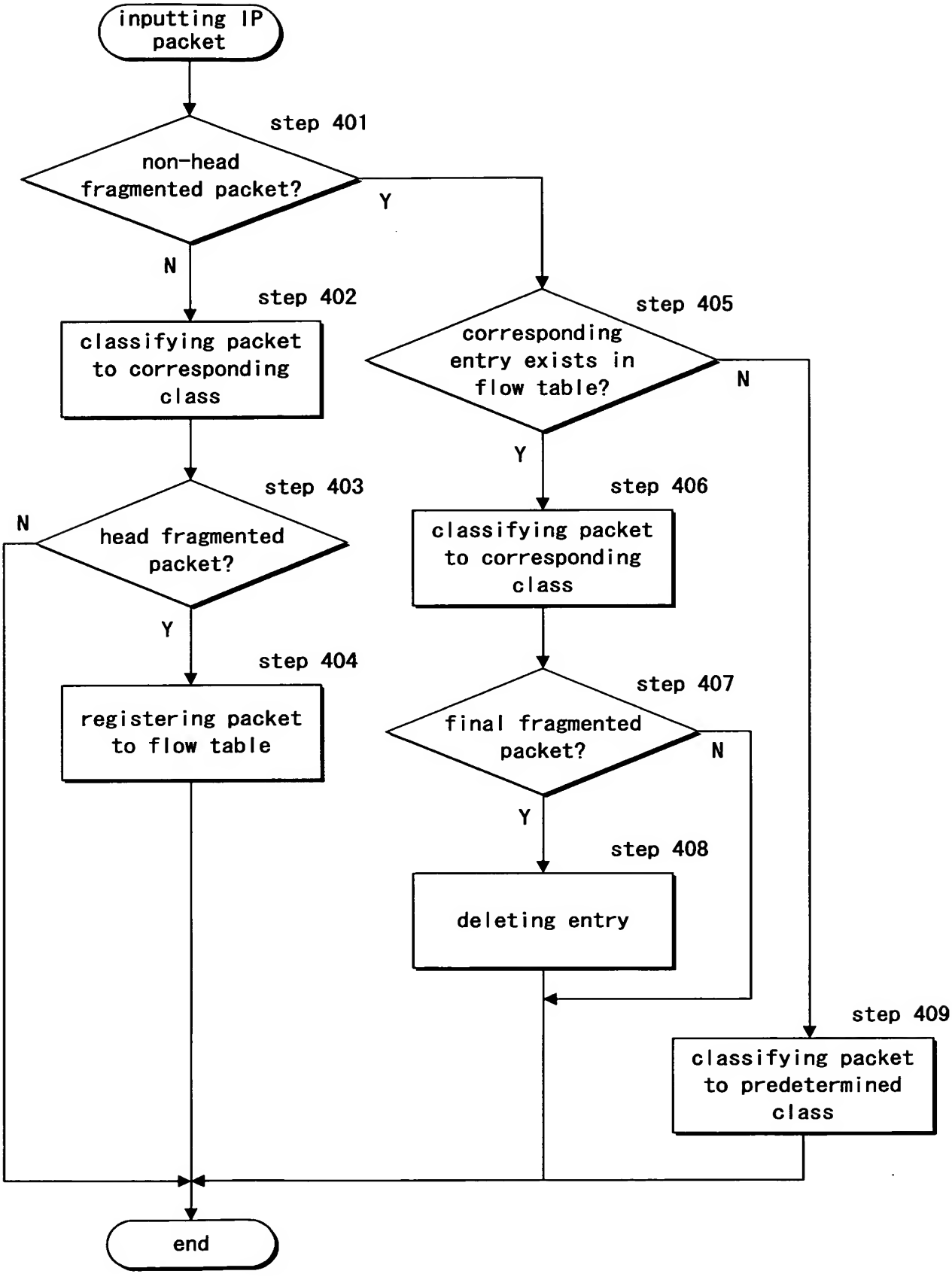

inputting IP packet
step 401
non-head fragmented packet?
Y
N
step 402
classifying packet to corresponding class
step 403
head fragmented packet?
N
Y
step 404
registering packet to flow table
step 405
corresponding entry exists in flow table?
N
Y
step 406
classifying packet to corresponding class
step 407
final fragmented packet?
N
Y
step 408
deleting entry
step 409
classifying packet to predetermined class
end

Fig. 7

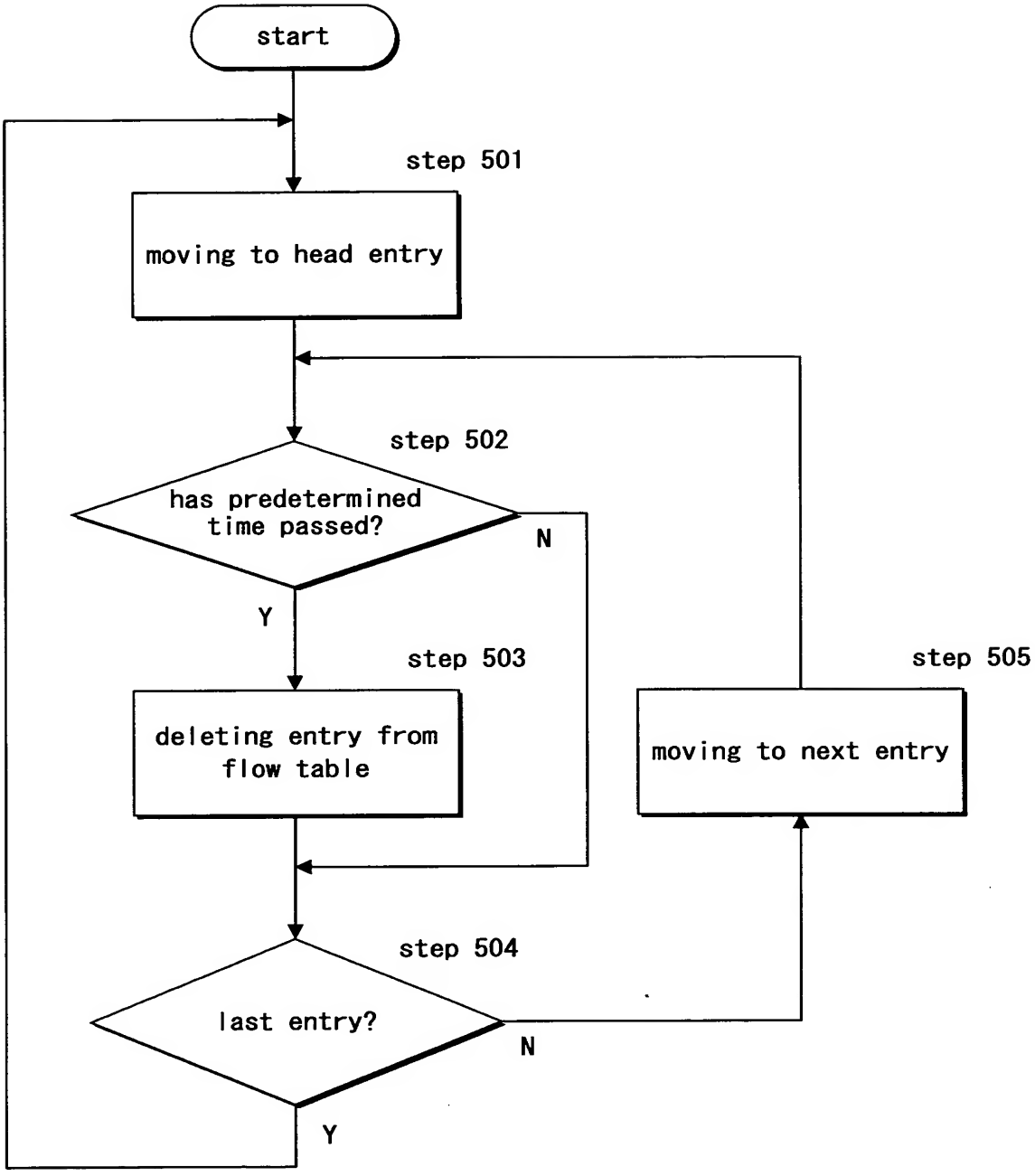

start
step 501
moving to head entry
step 502
has predetermined time passed?
N
Y
step 503
deleting entry from flow table
step 504
last entry?
N
Y
step 505
moving to next entry

Fig. 8

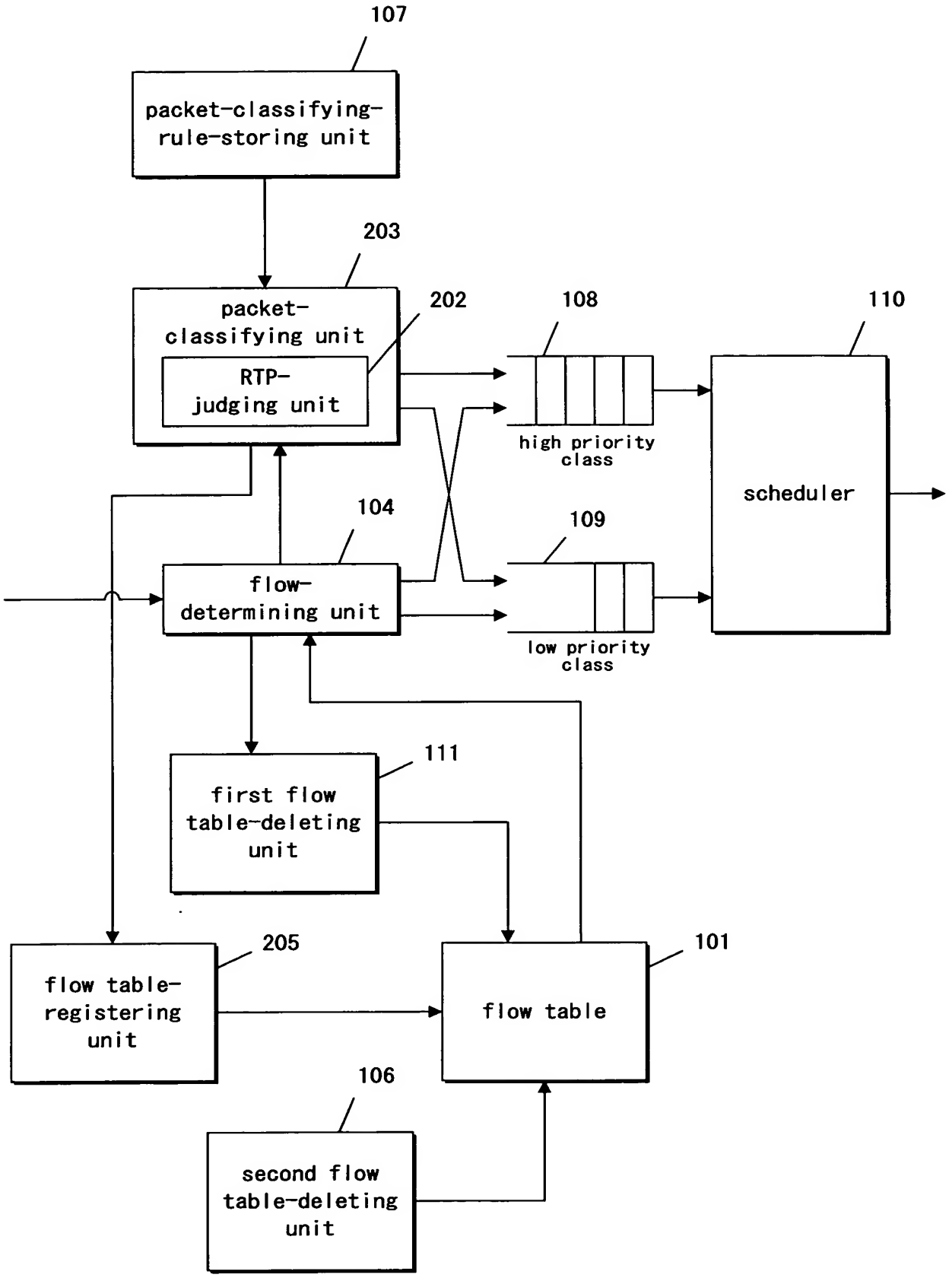

107
packet-classifying-rule-storing unit
203
packet-classifying unit
RTP-judging unit
202
108
high priority class
110
scheduler
104
flow-determining unit
109
low priority class
111
first flow table-deleting unit
205
flow table-registering unit
101
flow table
106
second flow table-deleting unit

Fig. 9

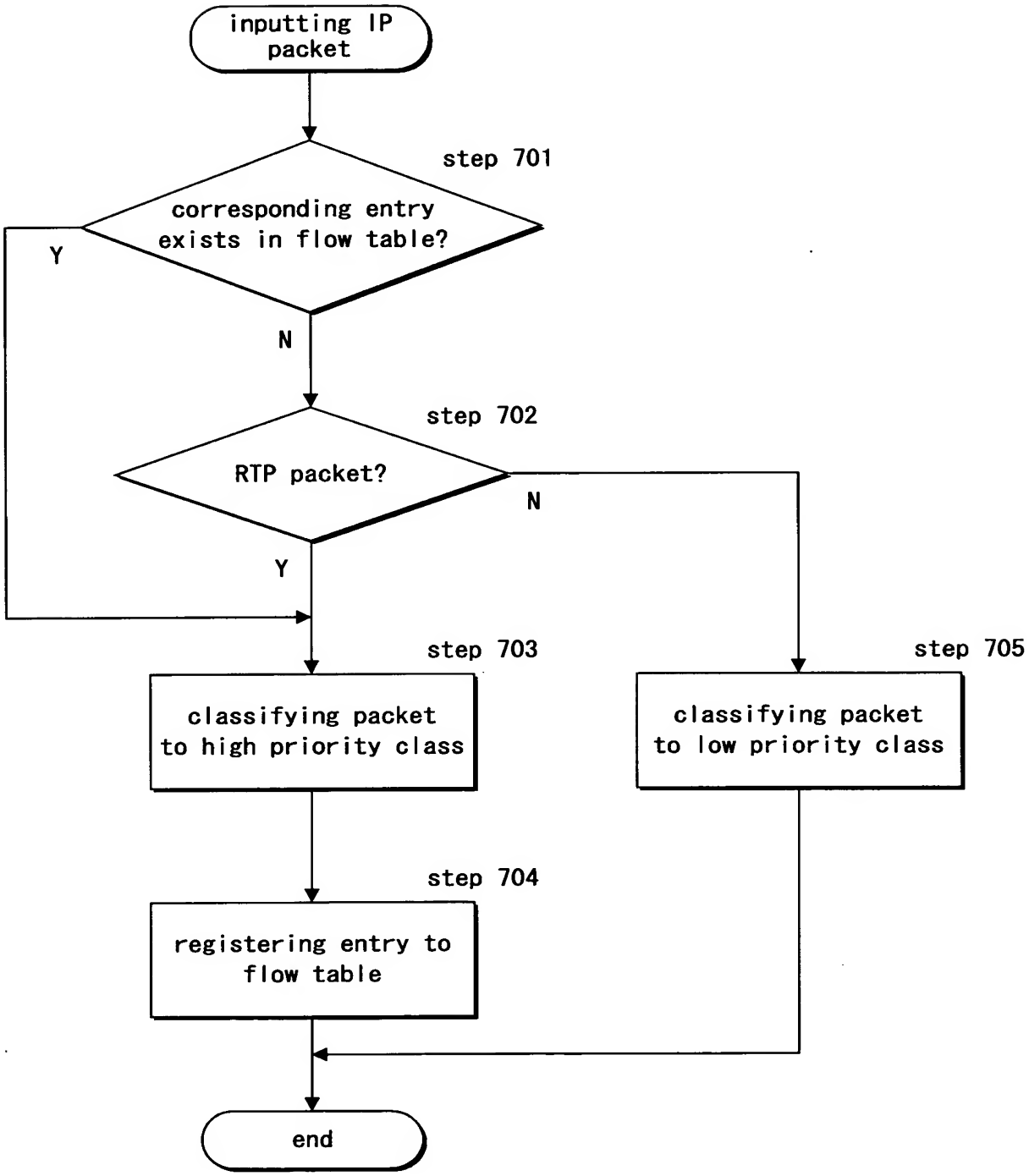

inputting IP packet
step 701
corresponding entry exists in flow table?
Y
N
step 702
RTP packet?
N
Y
step 703
classifying packet to high priority class
step 705
classifying packet to low priority class
step 704
registering entry to flow table
end

Fig. 10

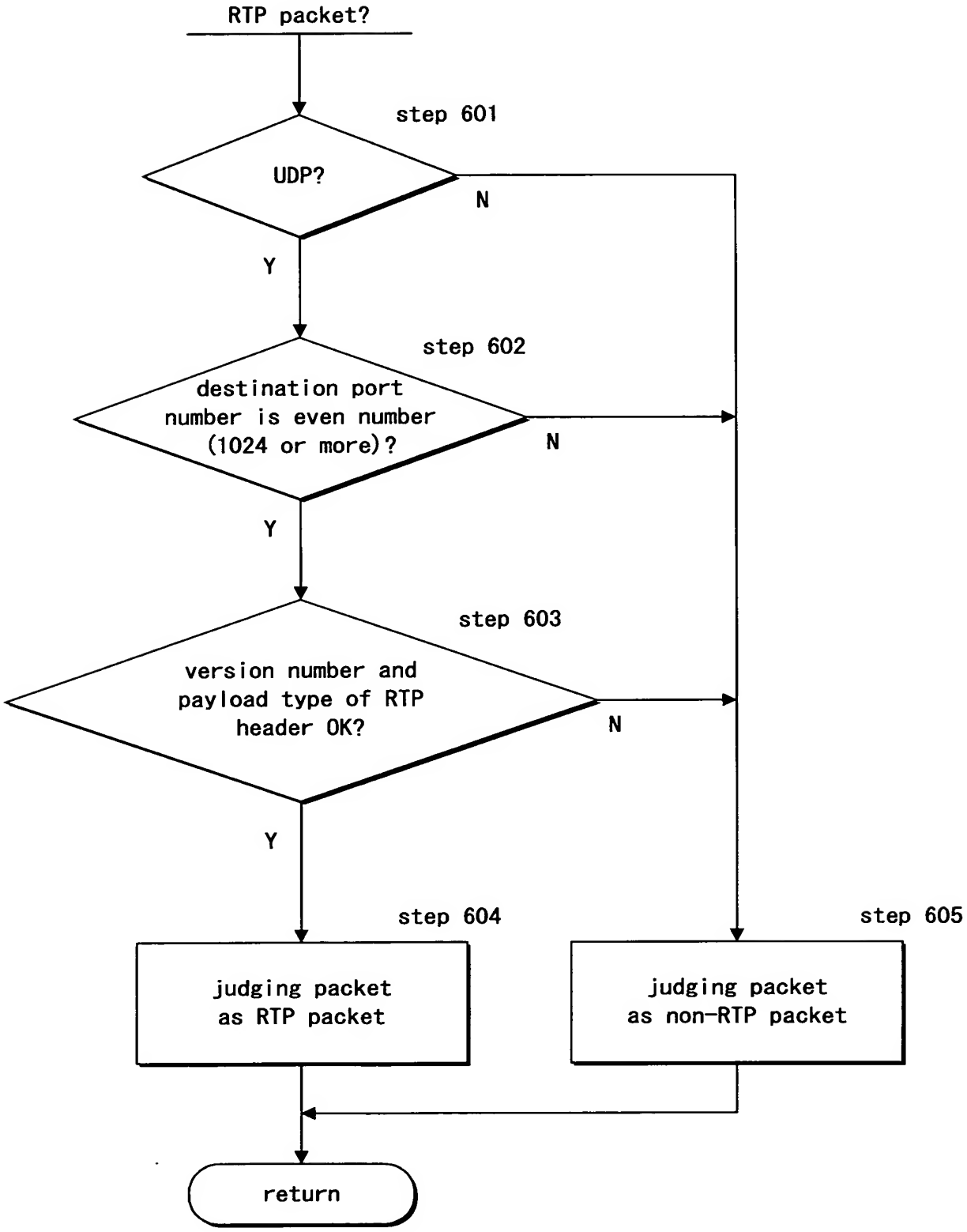

RTP packet?
step 601
UDP?
N
Y
step 602
destination port number is even number (1024 or more)?
N
Y
step 603
version number and payload type of RTP header OK?
N
Y
step 604
judging packet as RTP packet
step 605
judging packet as non-RTP packet
return

Fig. 11

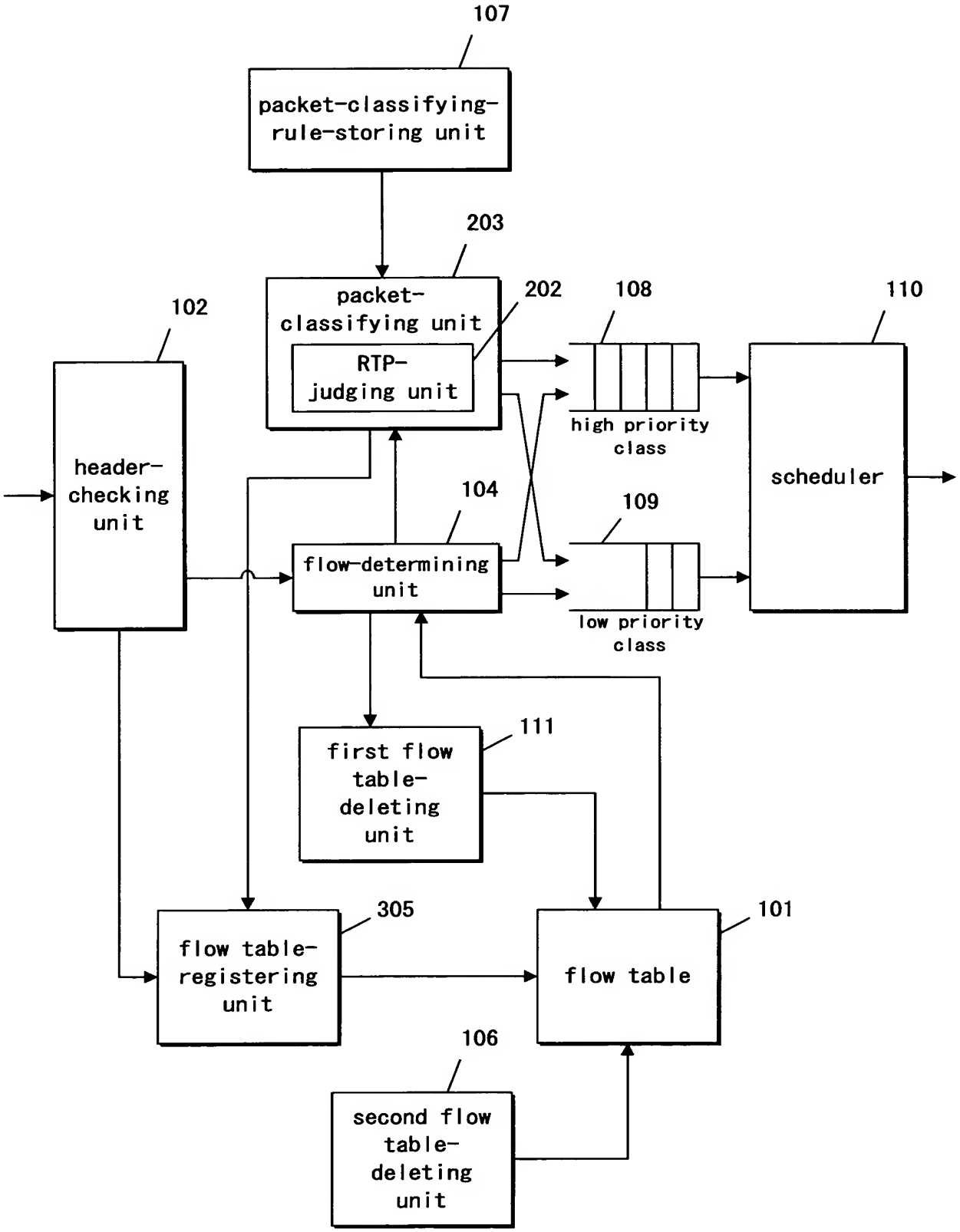
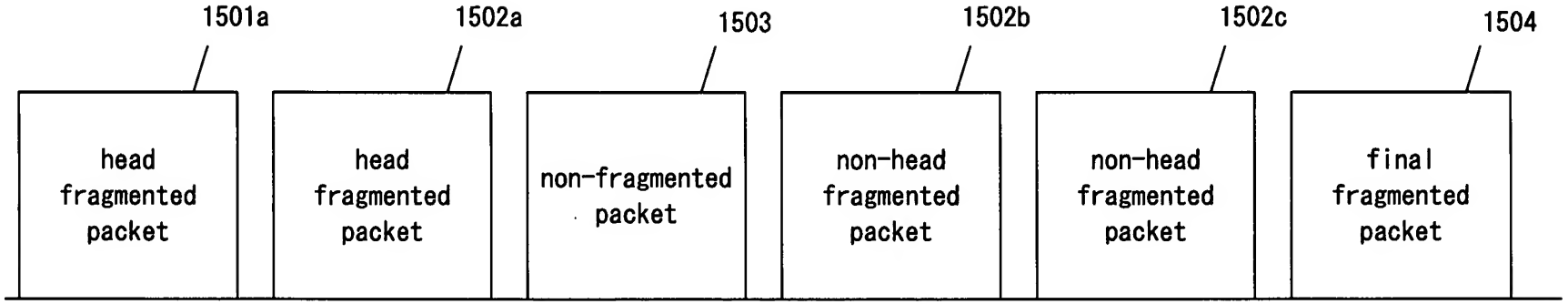

107
packet-classifying-rule-storing unit
203
packet-classifying unit
RTP-judging unit
202
108
110
102
high priority class
scheduler
header-checking unit
104
109
flow-determining unit
low priority class
111
first flow table-deleting unit
305
101
flow table-registering unit
flow table
106
second flow table-deleting unit

Fig. 12



src IP	address 1	src IP	address 1	src IP	address 2	src IP	address 1	src IP	address 1	src IP	address 1
dst IP	address b	dst IP	address a	dst IP	address c	dst IP	address a	dst IP	address a	dst IP	address a
protocol	TCP	protocol	UDP	protocol	UDP	protocol	UDP	protocol	UDP	protocol	UDP
src port	80	src port	2000	src port	3000	src port	—	src port	—	src port	2001
address ID	ID1	address ID	ID1	address ID	ID1	address ID	ID1	address ID	ID1	address ID	ID3

packets flow in this direction

Fig. 13 (a)

1601

destination IP address	source IP address	TCP/UDP	address ID	destination port number	class
address a	address 1	UDP	ID1	—	high
address a	address 1	UDP	—	2001	high
address c	address 2	UDP	—	3001	high

1601a
1601b
1601c

Fig. 13(b)

1602

destination IP address	source IP address	TCP/UDP	address ID	destination port number	class
address a	address 1	UDP	—	2001	high
address c	address 2	UDP	—	3001	high

1601b
1601c

Fig. 14

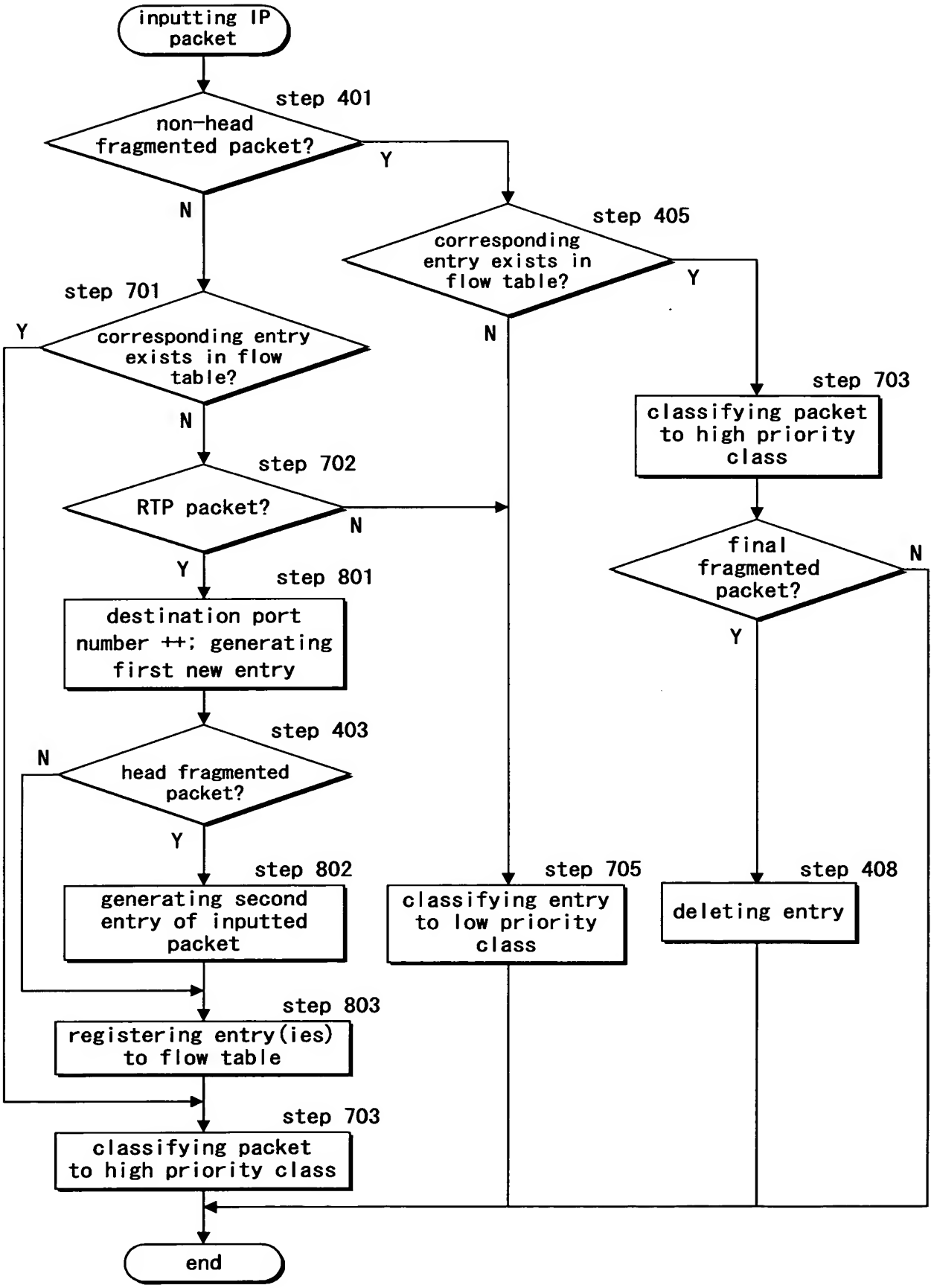

inputting IP packet
step 401
non-head fragmented packet?
Y
N
step 405
corresponding entry exists in flow table?
Y
N
step 701
corresponding entry exists in flow table?
Y
N
step 703
classifying packet to high priority class
step 702
RTP packet?
N
Y
final fragmented packet?
N
Y
step 801
destination port number ++; generating first new entry
step 403
head fragmented packet?
N
Y
step 802
generating second entry of inputted packet
step 705
classifying entry to low priority class
step 408
deleting entry
step 803
registering entry(ies) to flow table
step 703
classifying packet to high priority class
end

Fig. 15

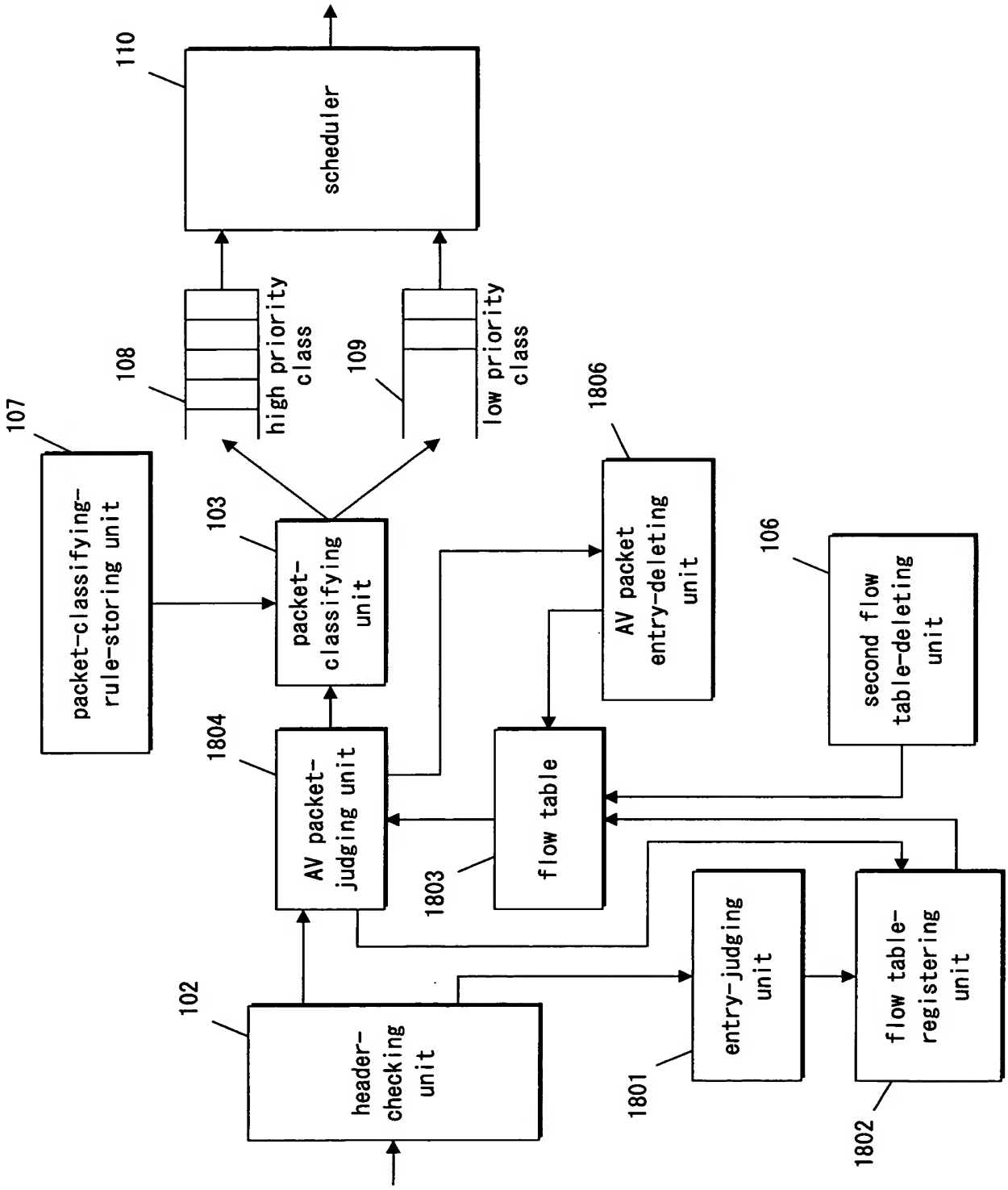

110
scheduler
108
high priority class
109
low priority class
107
packet-classifying-rule-storing unit
103
packet-classifying unit
1806
AV packet entry-deleting unit
106
second flow table-deleting unit
1804
AV packet-judging unit
1803
flow table
102
header-checking unit
1801
entry-judging unit
1802
flow table-registering unit

Fig. 16(a)

2101

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		6	80	1079	10	—	—	Yes	0

Fig. 16(b)

2102

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		17	3000	4000	20	1	500	No	0

Fig. 16(c)

2103

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		17	3000	4000	30	2	500	No	2

Fig. 16(d)

2104

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		17	3000	4000	100	499	500	No	900

Fig. 16(e)

2105

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		17	3000	4000	110	500	500	Yes	0

Fig. 16(f)

2106

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		17	2000	3000	10	1	30	No	0

Fig. 16(g)

2107

destination IP address	source IP address	protocol	destination port number	source port number	address ID	packet number	threshold	judgment result	entry time
		17	3000	4000	20	2	500	No	2

Fig. 17

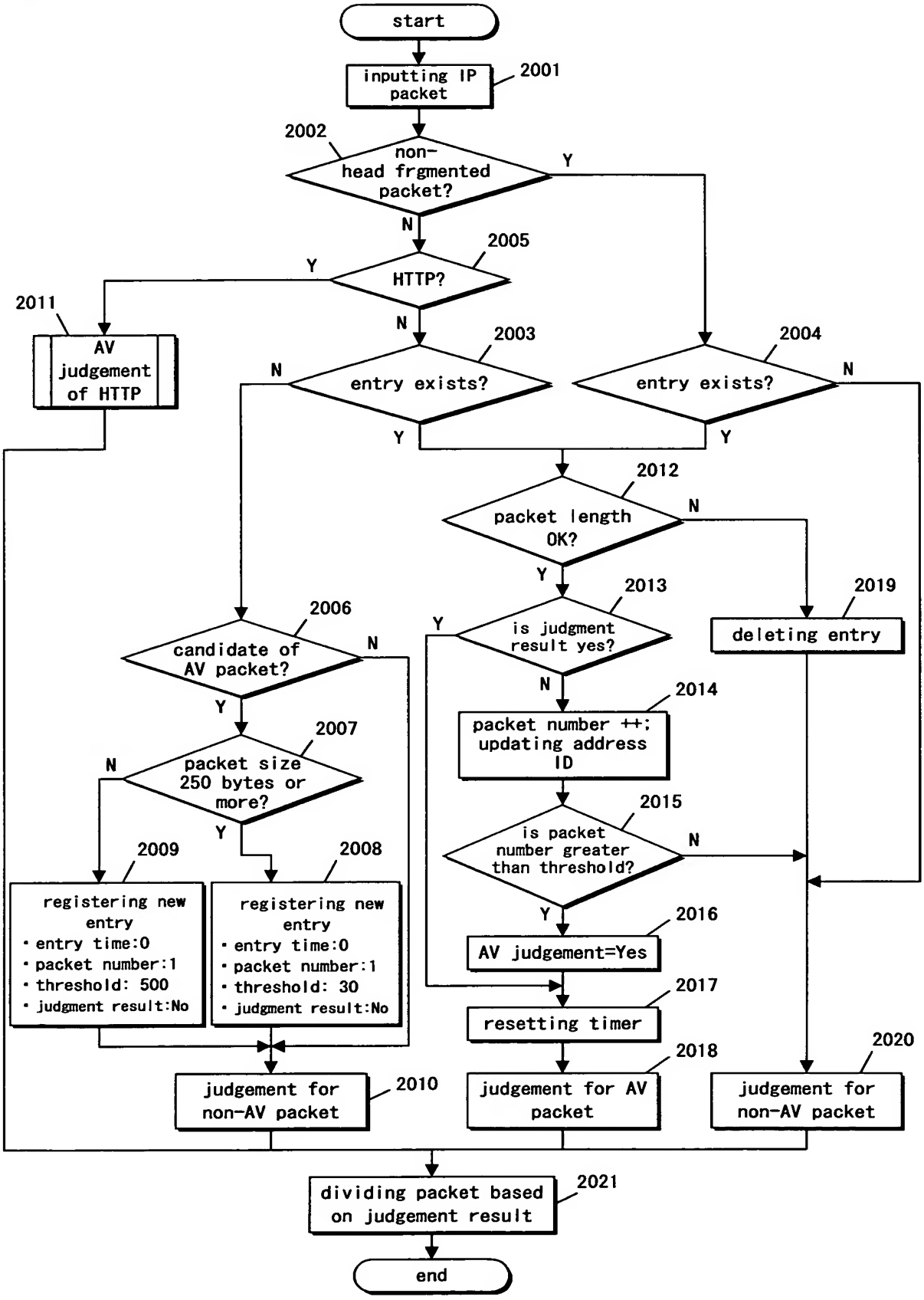

start
inputting IP packet
2001
2002
non-head frgmented packet?
Y
N
2005
HTTP?
Y
N
2011
AV judgement of HTTP
2003
entry exists?
N
Y
2004
entry exists?
N
Y
2012
packet length OK?
N
Y
2013
is judgment result yes?
Y
N
2019
deleting entry
2006
candidate of AV packet?
N
Y
2007
packet size 250 bytes or more?
N
Y
2009
registering new entry
• entry time:0
• packet number:1
• threshold: 500
• judgment result:No
2008
registering new entry
• entry time:0
• packet number:1
• threshold: 30
• judgment result:No
2014
packet number ++; updating address ID
2015
is packet number greater than threshold?
N
Y
2016
AV judgement=Yes
2017
resetting timer
2018
judgement for AV packet
2010
judgement for non-AV packet
2020
judgement for non-AV packet
2021
dividing packet based on judgement result
end

Fig. 18

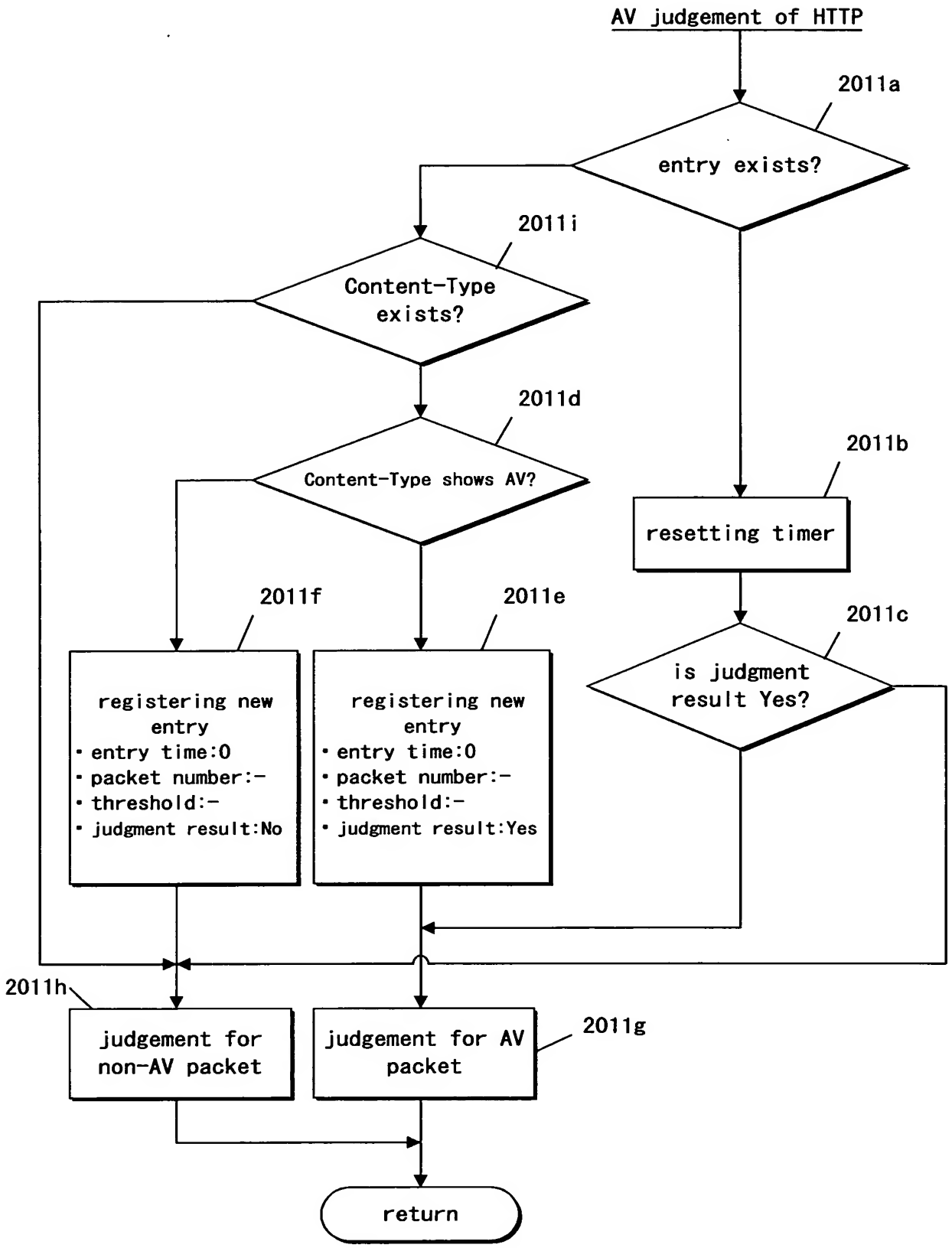

AV judgement of HTTP
2011a
entry exists?
2011i
Content-Type exists?
2011d
Content-Type shows AV?
2011b
resetting timer
2011c
is judgment result Yes?
2011f
registering new entry
• entry time:0
• packet number:-
• threshold:-
• judgment result:No
2011e
registering new entry
• entry time:0
• packet number:-
• threshold:-
• judgment result:Yes
2011h
judgement for non-AV packet
judgement for AV packet
2011g
return

Fig. 19

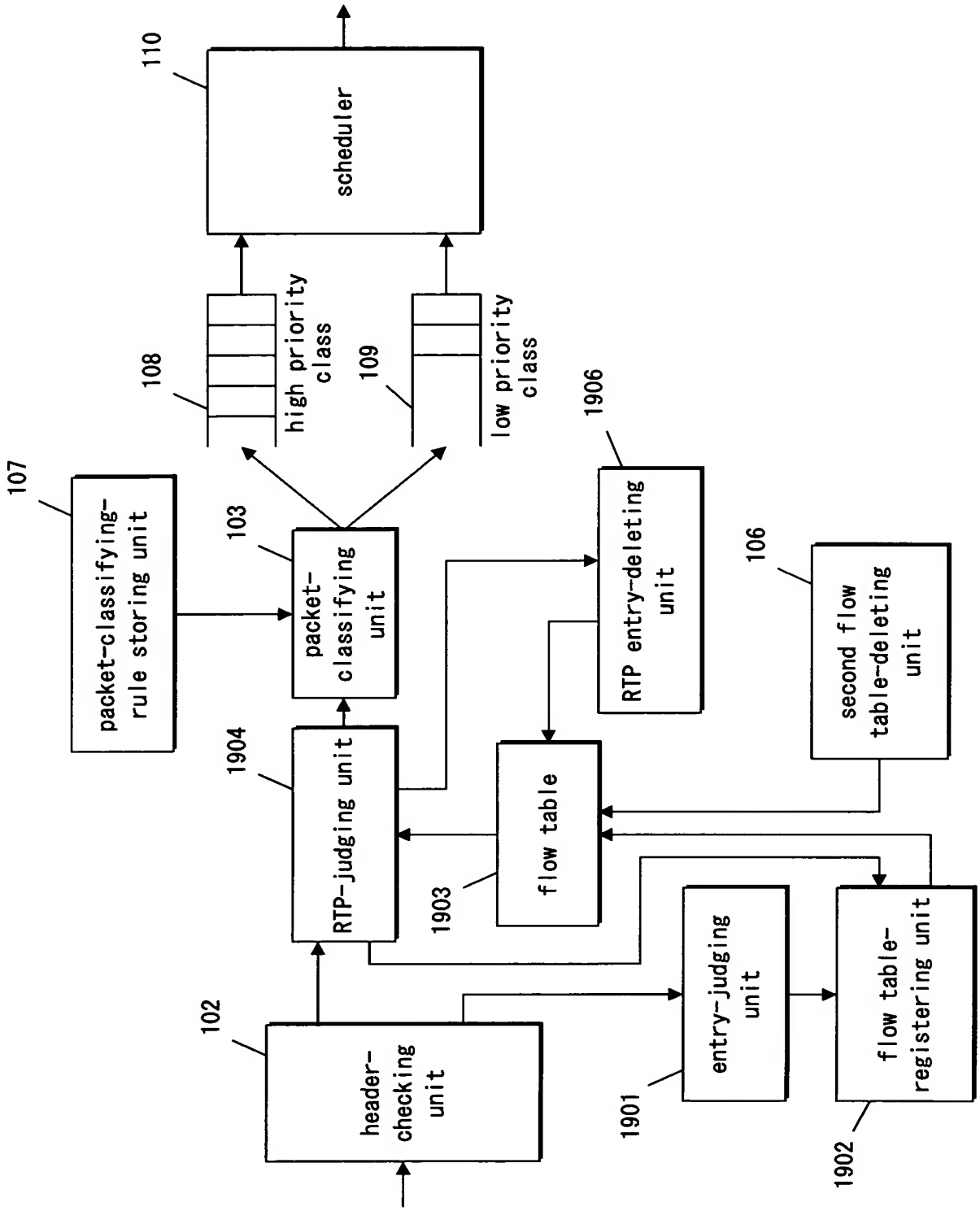

110
scheduler
108
high priority class
109
low priority class
107
packet-classifying-rule storing unit
103
packet-classifying unit
1906
RTP entry-deleting unit
106
second flow table-deleting unit
1904
RTP-judging unit
1903
flow table
102
header-checking unit
1901
entry-judging unit
1902
flow table-registering unit

Fig. 20(a)

2301

source IP address	destination IP address	protocol	destination port number	source port number	address ID	payload type	SSRC	packet number	thresh-old	judgment result	entry time
address 1	address a	17	2000	2000	10	31	1000	1	500	No	0

Fig. 20(b)

2302

source IP address	destination IP address	protocol	destination port number	source port number	address ID	payload type	SSRC	packet number	thresh-old	judgment result	entry time
address 1	address a	17	2000	2000	20	31	1000	2	500	No	5

Fig. 20(c)

2303

source IP address	destination IP address	protocol	destination port number	source port number	address ID	payload type	SSRC	packet number	thresh-old	judgment result	entry time
address 1	address a	17	2000	2000	100	31	1000	499	500	No	800

Fig. 20(d)

2304

source IP address	destination IP address	protocol	destination port number	source port number	address ID	payload type	SSRC	packet number	thresh-old	judgment result	entry time
address 1	address a	17	2000	2000	200	31	1000	500	500	Yes	0

Fig. 21

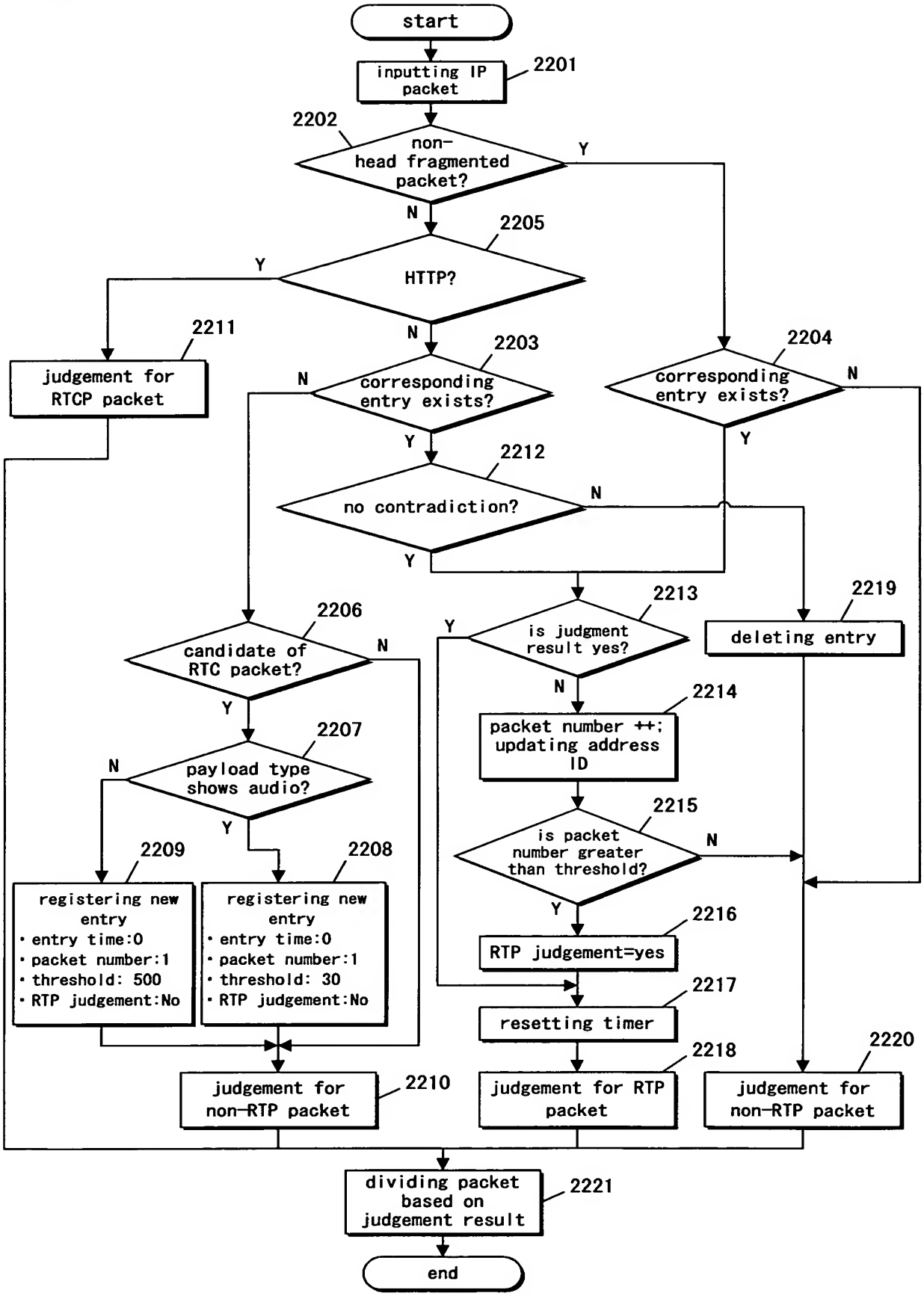

start
inputting IP packet
2201
2202
non-head fragmented packet?
Y
N
2205
HTTP?
Y
N
2211
judgement for RTCP packet
2203
corresponding entry exists?
N
Y
2212
no contradiction?
N
Y
2204
corresponding entry exists?
N
Y
2213
is judgment result yes?
Y
N
2219
deleting entry
2214
packet number ++; updating address ID
2215
is packet number greater than threshold?
N
Y
2216
RTP judgement=yes
2217
resetting timer
2218
judgement for RTP packet
2220
judgement for non-RTP packet
2206
candidate of RTC packet?
N
Y
2207
payload type shows audio?
N
Y
2209
registering new entry
• entry time:0
• packet number:1
• threshold: 500
• RTP judgement:No
2208
registering new entry
• entry time:0
• packet number:1
• threshold: 30
• RTP judgement:No
judgement for non-RTP packet
2210
dividing packet based on judgement result
2221
end

Fig. 22(a)

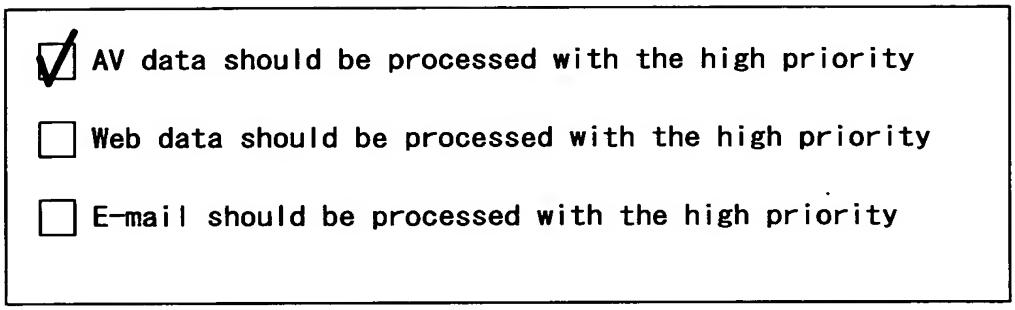


Fig. 22(b)

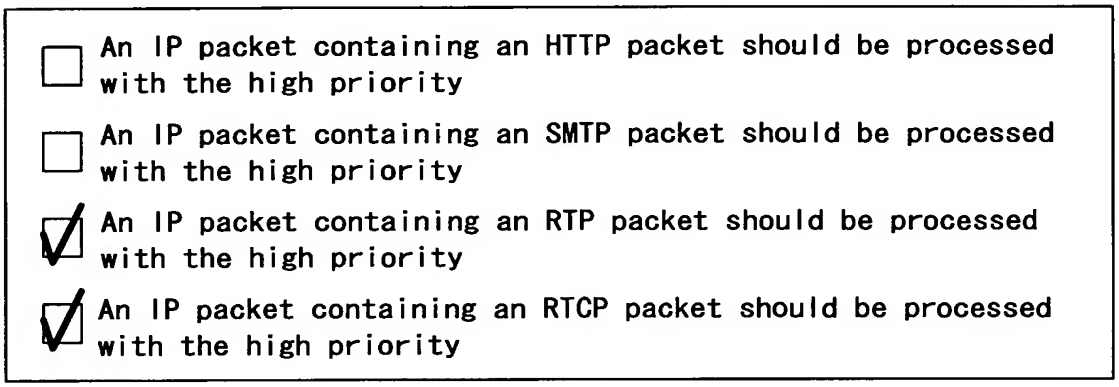


Fig. 23

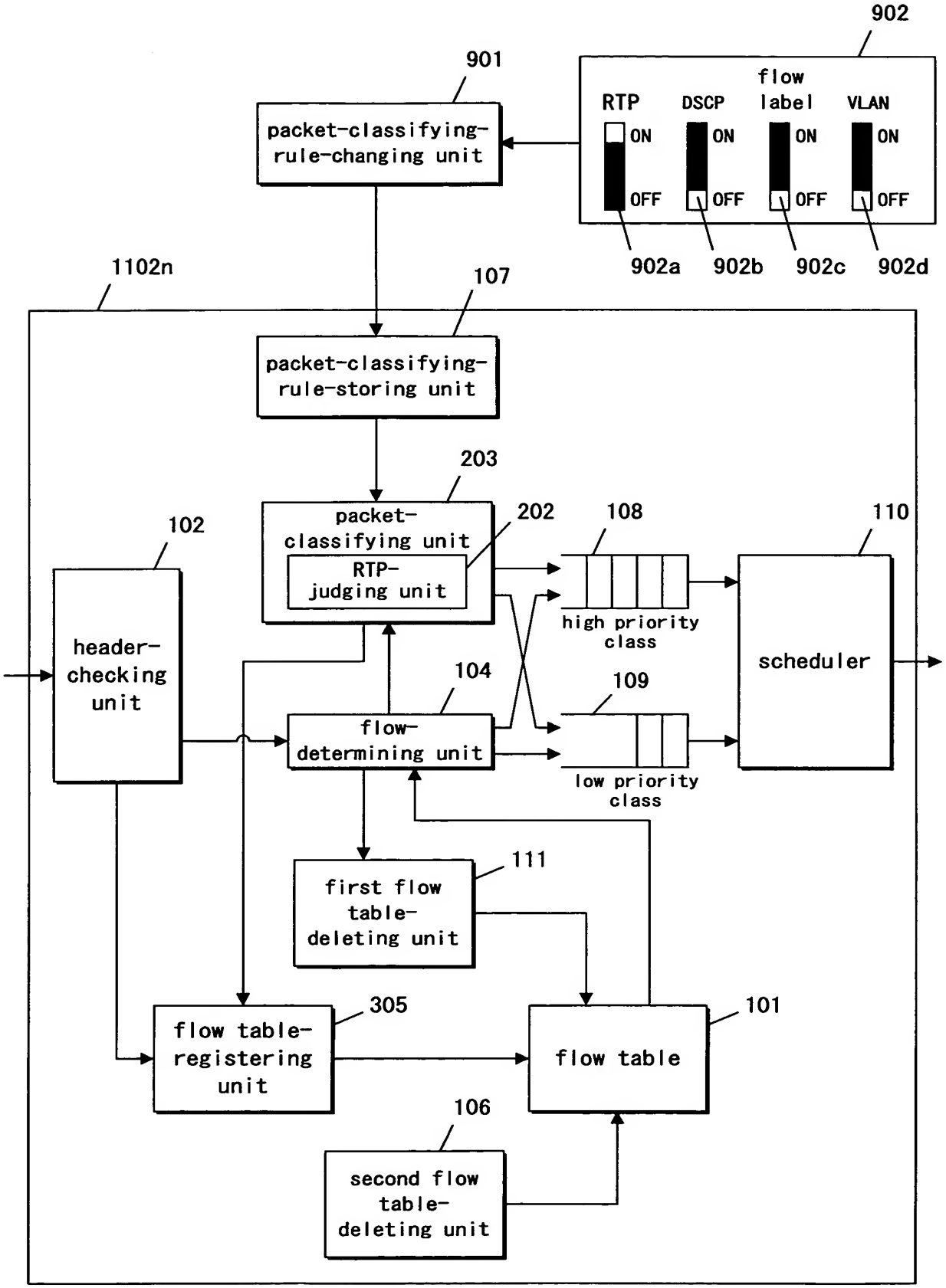

902
901
flow
RTP
DSCP
label
VLAN
ON
OFF
packet-classifying-rule-changing unit
902a
902b
902c
902d
1102n
107
packet-classifying-rule-storing unit
203
packet-classifying unit
RTP-judging unit
202
108
110
102
high priority class
header-checking unit
104
109
scheduler
flow-determining unit
low priority class
111
first flow table-deleting unit
305
101
flow table-registering unit
flow table
106
second flow table-deleting unit

Fig. 24(a)

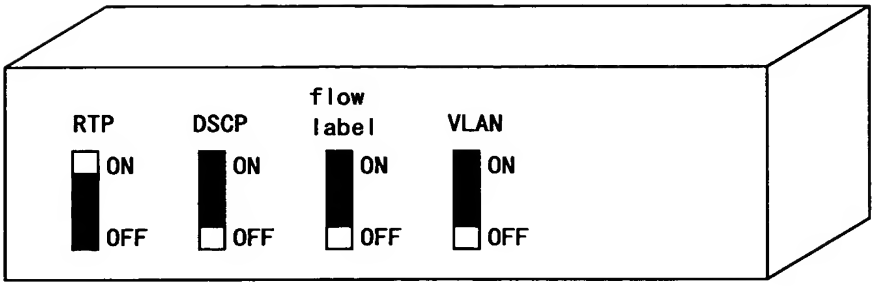


Fig. 24(b)

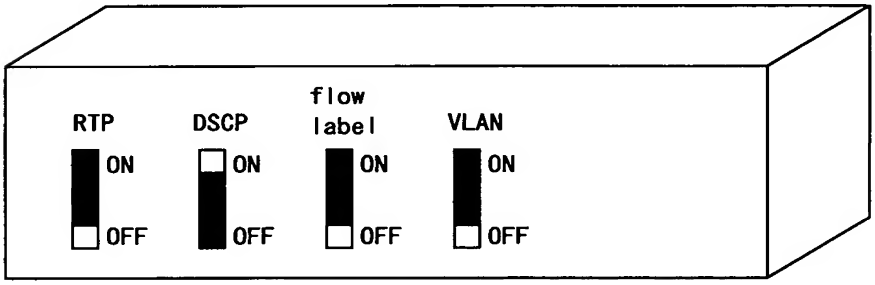


Fig. 25(a)

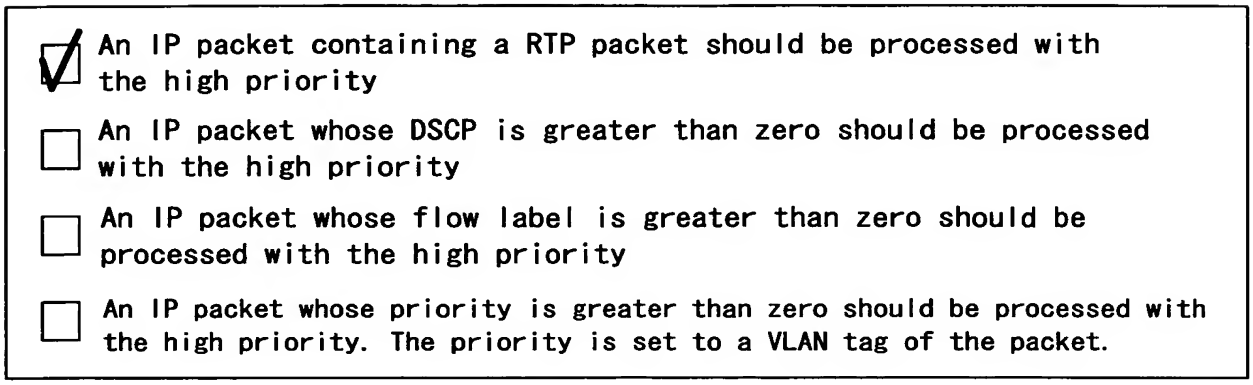


Fig. 25(b)